

PA-INDC

QUERY CONTROL FORM		RTIS USE ONLY	
Application No. <u>09/998,720</u>	Prepared by <u>J. Mullins</u>	Tracking Number <u>05808066</u>	
Examiner-GAU <u>Mullins-2834</u>	Date <u>9-28-03</u>	Week Date <u>7-28-03</u>	
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JACKET			
a. Serial No.	f. Foreign Priority	k. Print Claim(s)	p. PTO-1449
b. Applicant(s)	g. Disclaimer	l. Print Fig.	q. PTOL-85b
c. Continuing Data	h. Microfiche Appendix	m. Searched Column	r. Abstract
d. PCT	i. Title	n. PTO-270/328	s. Sheets/Figs
e. Domestic Priority	j. Claims Allowed	o. PTO-892	t. Other

SPECIFICATION	MESSAGE
a. Page Missing	
b. <u>Text Continuity</u>	The beginning of pg 2, the 1st 2 lines <del>sentences</del> appear to be duplicate data shown on pg 1.
c. Holes through Data	
d. Other Missing Text	
e. Illegible Text	Bottom of pg 2 ends with a period and the begining of pg 3 begins in the middle of a sentence.
f. Duplicate Text	
g. Brief Description	
h. Sequence Listing	
i. Appendix	
j. Amendments	
k. Other	
CLAIMS	
a. Claim(s) Missing	
b. Improper Dependency	
c. Duplicate Numbers	
d. Incorrect Numbering	
e. Index Disagrees	
f. Punctuation	
g. Amendments	
h. Bracketing	
i. Missing Text	
j. Duplicate Text	
k. Other	
	RESPONSE Called applicant 3/11/04 Delete lines 1-2 on p. 2 Delete "enough... (Ld-Lg)" on line 1, p. 3.
	Thank You initials <u>JM</u>
	<u>Bm</u> initials

~~magnets for magnetic poles in the outer circumference of the rotor core, and mounting a rotary shaft in the center.~~

In this way, by burying permanent magnets inside the rotor, the buried permanent magnet motor can utilize not only the magnet torque but also the reluctance torque, in which the reluctance torque is generated in addition to the magnet torque by the permanent magnets, as an inductance difference occurs between the inductance  $L_d$  in the direction of the d-axis which is a direction for coupling the center of the permanent magnet and the rotor center, and the inductance  $L_q$  in the direction of the q-axis which is a direction rotated 90 degrees of electrical angle from the d-axis. This relation is shown in formula (1).

$$T = P_n \{ \psi_a I_q + 1/2(L_d - L_q) \times I_d \times I_q \} \dots (1)$$

where  $P_n$  : number of pole pairs

$\psi_a$  : interlinkage magnetic flux

$L_d$  : d-axis inductance

$L_q$  : q-axis inductance

$I_q$  : q-axis current

$I_d$  : d-axis current

Formula (1) shows a voltage equation of dp conversion. For example, in a surface magnet motor, since the permeability of the permanent magnet is nearly equal to that of air, both inductance  $L_d$  and  $L_q$  in formula (1) are nearly equal values, and the reluctance torque portion expressed in the second term enclosed in braces in formula (1) does not occur.

*en* ~~enough to increase the difference of  $(L_d - L_q)$ .~~ The inductance  $L$ , which expresses the degree of ease of passing of magnetic flux, is proportional to  $N, Q$  (number of turns of teeth), and hence by increasing the number of turns on the teeth, the difference of  $(L_d - L_q)$  becomes larger, so that the reluctance torque can be

5 increased. However, if the number of turns is increased in order to utilize the reluctance torque more, as the number of turns increases, the winding group projecting to the stator end surface, that is, the coil end becomes larger. Hence, to rotate and drive the motor efficiently, if attempted to make use of the reluctance torque, the coil end becomes larger, and the motor itself is increased in size.

10 In the distributed winding, moreover, by turning windings plural times, a winding ring is formed, and this winding ring is inserted into the teeth, and the periphery of the winding ring becomes longer than the periphery of teeth. Still more, in the distributed winding, since the teeth are wound through slots, the windings cross each other. Thus, in the distributed winding, the winding projects

15 from the stator end, and the windings cross each other to increase the size of the coil end.

Hence, if attempted to drive the motor efficiently by making use of the reluctance torque, the motor size becomes larger. To the contrary, if the motor is reduced in size, the output of the motor drops.

20 In the air-conditioner, refrigerator, electric vehicle, etc., however, a motor of large output and small size is required.

Incidentally, the magnetic pole portion at the end of the teeth in the stator is formed wider in the peripheral direction.

Between the adjacent magnetic pole portions, however, since openings are

25 formed for laying down windings in the slots, the interval of ends of teeth must be